Jiro TANAKA & Mitsuo CHIHARA*: **Notes on algae in Japan and adjacent waters (1)**

田中次郎・千原光雄*: 日本およびその近海の藻類 (1)

During our studies on the algae in Japan and adjacent waters, we have encountered several species which are not well described or noteworthy from the view points of taxonomy or phytogeography. The present paper is the first of a short series dealing with such algae. We report *Giffordia sandriana* (Zanardini) Hamel and *Acinetospora crinita* (Carmichael) Kornmann from Japan for the first time.

1) **Giffordia sandriana** (Zanardini) Hamel (Fig. 1, A-G).
Hamel, Phéophycées France Fasc. 5: 14 (1939)-Kylin,Phaeophyceen Schwed. Westküste, 10, fig. 3, C-D (1947)-Taylor, Mar. Alg. North-eastern coast N. Amer., 111 (1957)-Cardinal, Nova Hedwigia Beih. 15: 37, fig. 38 (1964)-Clayton, Aust. J. Bot. 22: 782, fig. 23-24 (1974).

Ectocarpus sandrianus Zanardini in Kützing, Species Algarum, 451 (1849); Tab. Phycol. 5: tab. 52 (1855)-Zanardini, Icon. phycol. mediterraneo-adriatica 2: 143, pl. 74b (1865)-De Toni, Sylloge Algarum 3: 558 (1895)-Rosenvinge & Lund, Mar. Alg. Denmark 2: 44, fig. 18 (1941).

E. elegans Thuret in Le Jolis, List. Alg. Mar. Cherbourg, 77, pl. 2 (1863)-De Toni, l. c. 3: 542 (1895)-Hamel, l. c. Fasc. 1, 28, fig. 6 (1931).

Thalli, as found in Izu, epiphytic, densely tufted; main filaments measuring 5-15 mm in height and 20-40 μm in diameter, gradually tapering off towards their tips and somewhat attenuated at the lowermost part; in the upper part, consisting of long cells whose shape is cylindrical with the width measuring 16-20μm and the length 2-3 times the breadth; in the middle part, consisting of intercalary meristematic short cells whose shape is more or less barrel-like with the breadth of 20-32 μm and the length usually shorter than the width; in the lower part, consisting of columnar cells with the width of about 22 μm and the length 3 times the width; cells containing a number

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of small disc-shaped chloroplasts, each with a pyrenoid; rhizoids occurring from the lower part of the main filaments, descending and covering loosely the lowermost part of the filaments, but not forming corticating filaments; branching usually unilateral, very frequent particularly in the upper part of the filament; branches thinner than the main filaments, about 20 μm in diameter attenuated toward the tip, ending in a small cell, measuring about 10 μm in diameter, intercalary meristematic cells lining up as in the main filaments; no colorless hairs existing on any of the filaments; plurilocular reproductive organs seen throughout the growing period even on small thalli, about 1 mm in height, arising unilaterally on the adaxial side of the branches, often in a line, alternating with secondary branches, sessile, ovoid, often curved adaxially, measuring 40-64 μm long and 15-25 μm broad; unilocular reproductive organs not observed.

Habitat. Growing with *Myrionema* sp. on the other algae, found predominantly on old thalli of *Spatoglossum pacificum* and *Pachydictyon coriaceum* in the lower litoral zone, particularly in exposed flat surf areas.

Type locality. Adriatic Sea, Italy (as *Ectocarpus sandrianus*).

Geographical distribution. Adriatic Sea, Atlantic Ocean, North-eastern coast of North America, Southern Australia.

Representative specimens examined. Shimoda, Shizuoka-ken, May 23, 1974 (Tanaka 1007); The same, June 21, 1974 (Tanaka 1016); The same, March 27, 1975 (Tanaka 1127)-Choshi, Chiba-ken, May 5, 1966 (Tanaka 1299).

The present alga is very similar with *Giffordia sandriana* (Zanardini) Hamel in many respects, such as the gross morphology, the size of main and lateral filaments, the method of branching, and the shape of plurilocular reproductive organs. This species was first described by Zanardini (1849) as a member of *Ectocarpus* and later transferred to *Giffordia* by Hamel (1939), who erected the genus separating it from *Ectocarpus*. The basis for this separation was the possession of discoid plastids and sessile plurilocular reproductive organs, the absence of basal meristems and pseudohairs. *Giffordia sandriana* is known to occur on many coasts of both northern and southern hemispheres, including Europe, North America and Australia. From the data published so far for this species, there is considerable variation, especially as regards the size of filaments and of reproductive organs. With this point in mind, we have made periodical observations on the alga at

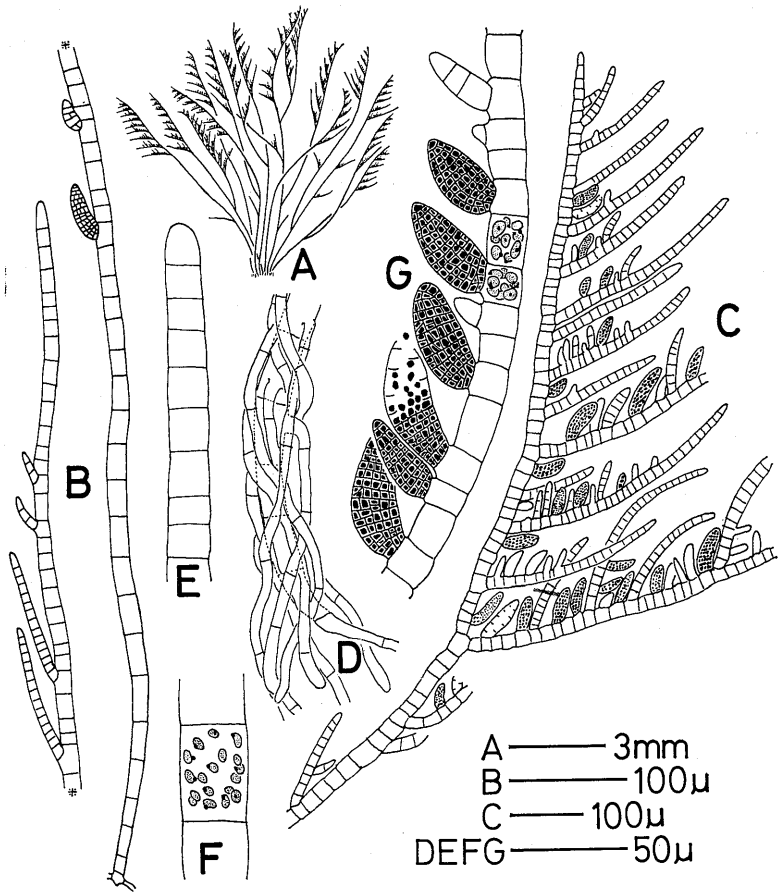

Fig. 1. *Giffordia sandriana* (Zanardini) Hamel. A. Gross morphology of the thallus. B. Filaments with plurilocular reproductive organ. C. Branches on which plurilocular reproductive organs arise. D. Rhizoids. E. Tip of main filament. F. Cell with chloroplasts of the middle part of the main filament. G. Plurilocular reproductive organs on one side of a branch.

Shirahama near Shimoda, Izu Peninsula.

Thalli visible to the naked eye appear in early winter and abundant growth of the plants is observed in winter and spring. In Table 1, the results of our measurements of the filaments and reproductive organs of *G. sandriana* are listed together with those of *G. sandriana* made by previous workers. As

Table 1. Measurements of the filaments and reproductive organs of *Giffordia sandriana*, obtained by the published papers and the present study.

	Diameter of main filament (μm)	Size of plurilocular reproductive organs (μm)
Setchell & Gardner (1922) as *G. granulosoides*	70-80	12-20×40-60
Hamel (1931)	30-70	15-30(-35)×50-60
Rosenvinge & Lund (1941)	25-56	10.5-21×28-47(-60)
Kylin (1947)	25-50	20-35×40-65
Taylor (1957)	30-100	15-35×45-60
Cardinal (1964)	25-75	18-30×35-100
Clayton (1974)	34-48	29-41×41-63
Present specimens (1976)	20-40	15-25×40-64

is seen in this table, the size of the characters concerned of our material fall within the range of previous value of plants of *G. sandriana*, with the minor exception that the filaments are slightly thinner than those of previously described specimens. It is well known by phycologists that morphological characters of the *Ectocarpus-Giffordia* complex tend to vary considerably depending on ecological conditions, and thus the variations we have observed, e. g. filament diameter, probably result from the particular environment of the plants at Shirahama near Shimoda. We therefore would like to refer the alga to *Giffordia sandriana*.

Clayton (1974) and Abbott & Hollenberg (1976) placed *G. granulosoides* as a synonym of this species on the basis of the description and illustration provided by Setchell & Gardner (1922), though the main filaments are fairly thicker than those of *G. sandriana*, as may be seen in table 1.

Kylin (1947) and Cardinal (1964) reported for this species the occurrence of unilocular reproductive organs, which were born on a branch together with plurilocular reproductive organs. According to them, unilocular reproductive organs were very rare. However, Clayton (1974) reported that the thalli of *G. sandriana* were commonly observed with unilocular reproductive organs in nature and in culture as in the case of the present study. Based on these observations, the occurrence of these organs seems to be influenced by external conditions.

G. sandraina may be easily distinguished from some other similar species: from *G. granulosa* by its unilateral branching, from *G. hincksiae*, which possesses constricted conical plurilocular reproductive organs, by its long ovoid plurilocular reproductive organs. Moreover, when this species is compared with *G. secunda*, a species most closed to it in such characters as the branching and shape of plurilocular reproductive organs, *G. sandriana* has thinner (20-40 μm) main filaments than those of *G. secunda* (60-100 μm). Some taxonomical confusion exists between *Giffordia* and *Feldmannia*. The latter may be distinguished from the former by possessing long pseudohairs and clear meristematic cells at the base.

2) **Acinetospora crinita** (Carmichael) Kornmann (Fig. 2, A-I). Kornmann, Helg. Wiss. Meer. **4**: 205, fig. 1-14 (1953)-Cardinal, Nova Hedwigia Beih. **15**: 70, fig. 37 (1964)-Clayton, Aust. J. Bot. **22**: 749, fig. 1 (1974).

A. pussila Bornet, Bull. Soc. France **38**: 370 (1891)-Buffham, Alg. Notes **21**: 88 (1893)-De Toni, Sylloge Alg. **3**: 567 (1895)-Hamel, Phéophycées France Fasc. **1**: 75 (1931)-Rosenvinge & Lund, Mar. Alg. Denmark **2**: 65, fig. 35 (1941).

Ectocarpus pusillus Griffiths in Wyatt, Alg. Danmonienses, exsiccatae no. 212 (1835)-Harvey, Phycol. Brit. **2**: pl. 153 (1849)-Bornet, l. c. **38**: 356, pl. 7 (1891)-Børgesen, Mar. Alg. Canary Islands **2**: 30, fig. 15-17 (1926).

E. crinitus Carmichael ex Harvey in Hooker, Brit. Flora **2**: 326 (1833)-Harvey, l. c. **2**, pl. 330 (1849)-Kützing, Species Algarum, 457 (1849); Tab. Phycol. **5**: pl. 70 (1855)-De Toni, l. c. **3**: 559 (1895)-Hamel, l. c. Fasc. **1**: 79 (1931).

Thalli, as found in Chiba and in Ibaraki, epiphytic or epilithic, forming loosely interwoved tufts, attaining a length of 30 cm or more; main filaments clearly demarcated from branches, 20-30 μm in diameter and equal size throughout the entire length of the filaments consisting of intercalary short cells whose length is about 0.5 times the width and of long cells whose length is 1-3 times the width; branching alternate, not frequent on the whole filaments; branches issuing from the middle portion of cells of the main filaments with almost right angle, often side by side from two adjacent cells, usually consisting of 2-20 cells, narrowing toward the tip, somewhat more slender than the main filaments; meristematic regions intercalary, scattered throughout the main filaments, consisting of 3-20 short cells; plu-

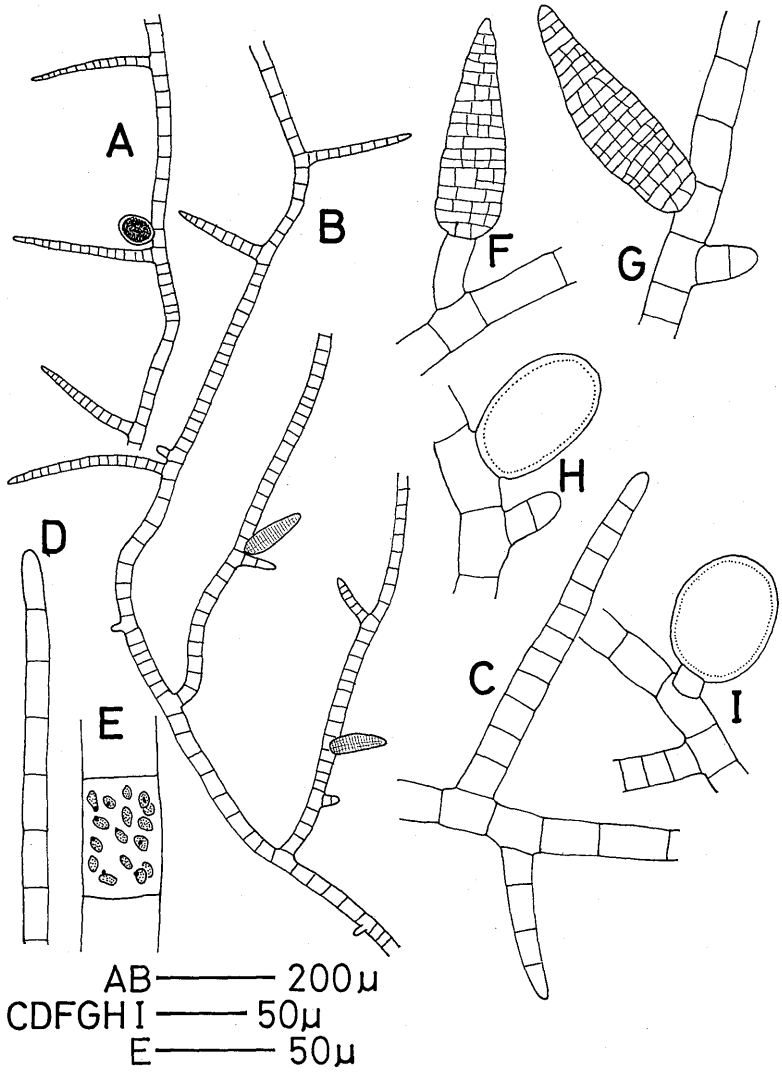

Fig. 2. *Acinetospora crinita* (Carmichael) Kornmann. A. Part of the filament bearing unilocular reproductive organ. B. Part of the filament bearing plurilocular reproductive organs. The filament consists of intercalary meristem. C. Short branches arising from the mother cells with almost right angles. D. Apical part of the main filament. E. Cell of the main filament having many discoid chloroplasts with single pyrenoid. F. Plurilocular reproductive organ. H. Sessile unilocular reproductive organ. I. Unilocular reproductive organ with one-celled stalk.

rilocular reproductive organs sessile or pedicelate with one or two stalked cells, ovoid or long conical, being somewhat pointed, 115-65 μm long and 30-50 μm broad; unilocular reproductive organs sessile or pedicellate with one stalked cell, spherical or ellipsoid, 45-65 μm long and 30-45 μm broad; both of these reproductive organs born on the same filaments.

Habitat. Epiphytic on *Sargassum thunbergii* and *Scytosiphon lomentarius* in upper intertidal zones of low wave actions or found as an epilithic in tide pools.

Type locality. Appin, Scotland. (as *Ectocarpus crinitus* Carm.)

Geographical distribution. Atlantic Ocean, Adriatic Ocean, Canary Islands, North Sea, South Australia.

Representative specimens examined. Kominato, Chiba-ken, March 1, 1975 (Tanaka 1300)-Izura, Ibaraki-ken, May 3, 1975 (Tanaka 1301).

The present alga seems to be referable to *Acinetospora crinita* (Carm.) Kornmann. Kornmann (1953) described and figured many aspects of the plant, such as the gross morphology, the size of main and lateral filaments, the size and shape of plurilocular reproductive organs and the site of meristematic regions. This species was first described by Carmichael (1833) as a member of *Ectocarpus* and later transfered to *Acinetospora* by Kornmann (1953), including *E. pusillus* as a synonym, because he confirmed with culture study that the latter species was merely a phase in the life history of *A.*

Table 2. Measurements of the filaments and reproductive organs of *Acinetospora crinita*, obtained by the published papers and the present study.

	Diameter of main filament (μm)	Size of plurilocular and unilocular reproductive organs (μm)
Børgesen (1926)	17-31	30-50×60-80
Hamel (1939)	21-50	33-60×65-180(50×60)*
Kornmann (1953)	20-30	35-55×90-140(30-50×45-75)
Cardinal (1964)	25-50	not described
Clayton (1974)	21-32	24-42×75-128
Present specimens	20-30	30-50×115-165(30-45×45-65)

* Size of unilocular reproductive organs in parenthesis

crinita. *A. crinita* is now reported to occur from Europe, North Africa and Australia. In Chiba-ken, we found it growing well and bearing both types of reproductive organs in the spring.

In Table 2, are collected the results of our measurements of the filaments and reproductive organs of our materials of *Acinetospora*, together with values obtained by the published papers of *A. crinita*. This table shows that the size of important characters for taxonomy of our materials is almost identical to those values reported for *A. crinita*.

Børgesen (1926) and Kornmann (1953) did not mention the occurrence of unilocular reproductive organs on *A. crinita* in nature; however, Bornet (1891) and Clayton (1974) observed these structures. In our field materials, we have often found unilocular reproductive organs, hence, the presence or absence of this reproductive structure seems to result from environmental conditions to which the plant is exposed.

With regard to the systematic position of *Acinetospora*, Hamel (1939) considered it to be a member of the Acinetosporaceae, interpreted by Hamel (1931), which was placed close to the Ectocarpaceae, on the basis of the presence of monosporangia, but for the present it seems better to place *Acinetospora* in the Ectocarpaceae because of its *Ectocarpus*-like thalli. Judging from the shape and size of the plurilocular reproductive organs, *Acinetospora* is probably closest to *Feldmannia* but differs from it in its longer filaments which possess many meristematic regions.

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褐藻類，シオミドロ目，シオミドロ科 Ectocarpaceae に属する 2 属 2 種 *Giffordia sandriana* と *Acinetospora crinita* を日本新産種として記載し，分類上の考察をおこなった。前者は，冬～初夏に他の海藻の着生藻としてよく生育する。長さ約 1 cm，太さ約 30 μm の細胞糸からなる個体が，コモングサ *Spatoglossum pacificum* などの体の表面をマット状におおうようにして群生する。後者は，春～夏に潮間帯上～中部のタイドプールに生育するウミトラノオ *Sargassum thunbergii* やカヤモノリ *Scytosiphon lomentarius* 等の体によく着生する。両属ともシオミドロ属 *Ectocarpus* に近縁と考察した。

○日本・台湾のアゼトウガラシ属（山崎　敬） Takasi YAMAZAKI : *Lindernia* in Japan and Taiwan

日本周辺のアゼナ類，アゼトウガラシ類については，先に一応整理したことがある（本誌 **30** : 170-180, 1955）が，其の後に学名の変更があり，また属の範囲についても人によって意見の違いがある。この群のアジアにおける分布の中心はインドシナであるが，最近，パリー自然博物館所蔵のこの群の標本を充分検討する機会があり，またタイから報告された種類のタイプ標本を，Kew 植物園から貸してもらったので，この群の関係がかなりはっきりしてきた。最近 Kew の Philcox がマレーシアのこの群を研究し，古いタイプ標本の検討をもとに学名を明らかにしてくれたので，使用さるべき学名も正確になってきた。詳細なことは別の機会にして，ここでは日本，台湾の種類とその学名を明らかにしておきたい。

アゼトウガラシ群，アゼナ群，スズメノトウガラシ群を同一属とするか，別属とするかは人によって意見の異る所であるが，最近の傾向は同一属としてあつかわれることが多い，上記 3 群は花や種子の形態から明らかに区別され，それぞれ進化の方向を異にする群と考えられ，Philcox が行ったようにアゼナ群を分解して，その種類をいくつかの他の群に所属させるあつかいは明らかに誤りである。然し 3 群とも外観はよく似ていて，解剖しなければその特徴がつかめない。系統は異っても，共通の祖先から分化したものと考えられるから，同一属として属の範囲を大きく見ることも実際的ではある。ここでは従来の学名の誤りを正し，同一属とした場合の学名を明らかにしておく。